



SELF-DRAINING SOLAR DEVICES TO PROTECT MODERN SOLAR COLLECTORS FROM DESTRUCTION

¹Sharif Karshiev Sherqulovich, ²Rakhmatilla Khayrullaev Saydullayevich,
³Nilufar Zufarova Nasibullayevna

PhD candidate at Tashkent Institute of Architecture and Civil Engineering Institute, Tashkent, Uzbekistan1,
Lecturer at Tashkent Institute of Architecture and Civil Engineering, Uzbekistan2,3

ABSTRACT

In this research paper describes drainage, use of antifreeze, electric heating, use of slow circulation, the advantages and disadvantages were identified and one was chosen for improvement: self-draining method of solar devices.

Keywords: *Devices, draining method, improving efficiency, thermal energy, solar heating systems, solar collectors.*

INTRODUCTION

There are 4 main methods to protect modern solar collectors from damage: drainage, use of antifreeze, electric heating, use of slow circulation, the advantages and disadvantages were identified and one was chosen for improvement: self-draining method of solar devices.

METHODS OF RESEARCH

One of the most beneficial areas in the field of solar energy use is the solar heating and hot water supply systems of these buildings. However, these systems are not widely used in the country. The reason for not expanding the use of solar energy for heating buildings is mainly the high capital expenditures for the construction of geosystems compared to the system of funds used in practice.

Increasing the practical use of solar energy for hot water supply and heating of various facilities in Uzbekistan, instead of expensive multi-circuit systems using antifreeze to protect solar collectors from damage in winter and summer, high-capacity simple single-circuit energy-efficient and reliable raises the issue of the development of self-draining solar devices.

Solar collectors are a key element of aquatic solar heat supply systems, operating under conditions of extremely variable sources of solar energy and outdoor air temperature in a very wide range: from low negative values in winter to high positive values in summer. Such conditions of use can lead to the failure of solar collectors: in winter as a result of freezing of water at night, and in summer - as a result of boiling water in stagnation mode (when the circulation stops) and the temperature inside solar collectors rises to 200oS and 300oC in vacuum.

The use of antifreeze in high-capacity solar devices is a very expensive solution due to the large area of solar collectors, moreover, this solution does not solve the problem of summer protection of solar collectors due to boiling antifreeze in the summer.

RESULTS

In self-draining solar devices, solar collectors are protected from damage due to the fact that there is complete drainage when the circulation pump stops in both winter and summer seasons. However, certain solutions of self-draining solar devices, which are widely used in world practice, include excessive consumption of electricity to circulate the heat carrier, hydraulic shocks when circulating pumps stop, low reliability and large loss of temperature potential in intermediate heat exchangers.

Self-draining solar devices are relatively energy-efficient and reliable self-draining solar devices with a simple single-circuit high-power solar system that reduces electricity consumption by 60%, eliminates hydraulic shocks when circulating pumps stop and increases thermal efficiency by 20%. focused on output and implementation.

Self-draining solar devices are related to the priorities of scientific research in the country and government programs or research plans.

These self-draining solar devices correspond to the priority direction of the development of science and technology of the Republic "Development of the use of renewable energy sources."

There are 4 main methods to protect solar collectors from damage: drainage, use of antifreeze, electric heating, use of slow circulation were analyzed, advantages and disadvantages were identified and one was chosen for improvement: use of venturi pipe in solar devices for self-drainage method.

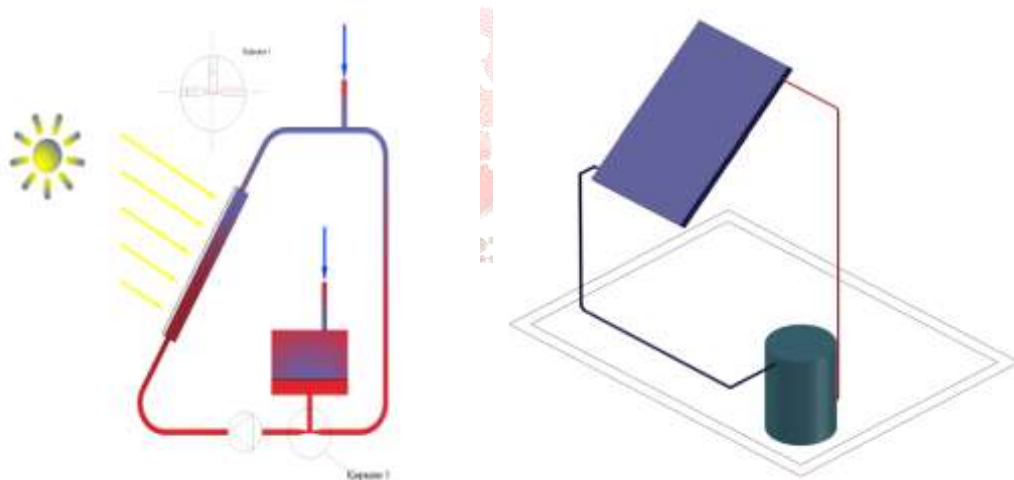


Fig.1. Modern venturi pipe in solar devices for self-drainage method

Scientific research on the theoretical and practical aspects of the conversion of solar energy into heat using flat solar collectors for water heating is being carried out in the world's leading research centers and universities.

CONCLUSION

The computational-theoretical and experimental results on the use in solar heat supply systems performed by D.A.Daffy, U.A.Beckman in the Solar Energy Laboratory of the University of Wisconsin, USA are of great importance in this field. These created solar devices are used today in many scientific, practical and design centers around the world.

The Swiss Institute of Solar Technology and the National Solar Energy Center of India conduct certification tests of solar collectors developed in different countries around the world.

In the Laboratory of Renewable Energy Sources and Energy Saving of the Joint Institute of High Temperatures (OIVTAN) of the Russian Academy of Sciences, under the leadership of O.S. Popel, generations of heat-resistant plastics were created and their heat test methods were improved. Currently, 16 leading companies around the world are producing self-draining solar systems.

REFERENCES

- [1] Frid, S.E., Lisitskaya, N.V., “State-of-the-Art Solar Collectors: Typical Parameters and Trends,” Applied Solar Energy (English translation of Geliotekhnika) vol.54, no.2, pp. 279-286, 2018.
- [2] W. Weiss, M. Spörk – Dür, “Solar Heat Worldwide. Global Market Development and Trends in 2017. Detailed Market Figures 2016. 2018 edition”. Internet:www.iea-shc.org/data/sites/1/publications/Solar-Heat-Worldwide-2018.pdf.
- [3] Y.K. Rashidov, “Improving the efficiency of using solar thermal energy in heat supply systems by minimizing temperature losses in the transfer of heat in their elements,” Environmental, industrial and energy security — 2018, Sevastopol: SevSU, 2018, pp. 988–1001
- [4] Y.K. Rashidov. Design dependencies for designing a self-draining solar system with an active element. International scientific-practical conference. ”Ecological, industrial and energy security”.2018.
- [5] J.A .Duffie and W.A. Beckman, Solar Engineering of Thermal Processes. Hoboken, New Jersey: John Wiley and Sons, 2013, 910 pp.

E-ISSN NO.2344-0721